1-1.10-31

EE24BTECH11062 - Homa Harshitha Vuddanti

Question:

Find the direction cosines of the line passing through the two points $\begin{pmatrix}-2\\4\\-5\end{pmatrix}$ and $\begin{pmatrix}1\\2\\3\end{pmatrix}$.

Solution:

Given two points, The direction vector is given as,

Variable	Description
A	point $\begin{pmatrix}-2\\4\\-5\end{pmatrix}$
B	point $\begin{pmatrix}1\\2\\3\end{pmatrix}$
m	direction vector along AB

TABLE 0: Variables used

$$m = \mathbf{B} - \mathbf{A} \tag{0.1}$$

$$m = \begin{pmatrix}1\\2\\3\end{pmatrix} - \begin{pmatrix}-2\\4\\-5\end{pmatrix} \tag{0.2}$$

$$m = \begin{pmatrix}3\\-2\\8\end{pmatrix} \tag{0.3}$$

Direction cosines are given by a unit vector in that direction-

$$\frac{AB}{||AB||} = \frac{m}{||m||} \tag{0.4}$$

$$||m|| = \sqrt{m^\top m} \tag{0.5}$$

$$||m|| = \begin{pmatrix}3\\-2\\8\end{pmatrix}^\top \begin{pmatrix}3\\-2\\8\end{pmatrix} \tag{0.6}$$

$$||m|| = \sqrt{77} \tag{0.7}$$

From equations (0.4) and (0.7), direction cosines are-

$$\frac{1}{\sqrt{77}}\begin{pmatrix}3\\-2\\8\end{pmatrix}=\begin{pmatrix}\frac{3}{\sqrt{77}}\\\frac{-2}{\sqrt{77}}\\\frac{8}{\sqrt{77}}\end{pmatrix} \tag{0.8}$$

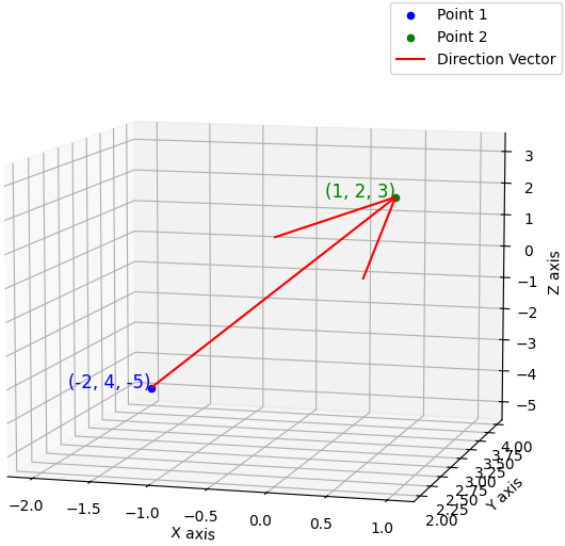

Fig. 0.1: Plot